Remarks

Further and favorable reconsideration is respectfully requested in view of the foregoing amendments and following remarks.

Initially, new claims 23-30 have been added to the application.

Claim 23 is supported by the disclosure at page 32, lines 14-16 of the specification.

Claims 24-26 are supported by page 37, lines 6-9.

Claims 27-30 are supported by the sentence bridging pages 29-30.

Applicants respectfully submit that these amendments should be entered even though they are being submitted after a final rejection. All of the new claims are directly or indirectly dependent on claim 12, which as shown by the remarks set forth below, is patentable over the prior art. Furthermore, there is no question about the presence of adequate support for the new claims in the specification, as apparent from the disclosures referred to above. Accordingly, since claim 12 is patentable, and should be allowed, new claims 23-30 should be entered, and allowed.

The objection to the amendment from "cyclohexane oxide" to --cyclohexene oxide-- as constituting new matter, is respectfully traversed.

The term "cyclohexene oxide" represents the same identical substance as does the term "cyclohexane oxide". In this regard, please see the attached copy of the Internet search results from chemexper.com and ChemFinder.Com.

For this reason, the objection to the amendment as constituting new matter should be withdrawn.

The corresponding rejection of claim 15 under the first paragraph of 35 U.S.C. §112 is respectfully traversed, and should also be withdrawn, for the same reason as indicated above in connection with the objection to the amendment to the specification based on new matter.

The patentability of the presently claimed invention over the disclosures of the references relied upon by the Examiner in rejecting the claims will be apparent upon consideration of the following remarks.

Thus, the rejection of claim 12 under 35 U.S.C. §102(b) or 35 U.S.C. §103(a) based on Summer et al. is respectfully traversed.

In response to Applicants' previous argument that the use of an alkali metal carbonate as a catalyst and an alkali metal hydroxide for crystallization in the process of the Summer et al. reference would never provide aromatic ethers with low metal contents (less than 100 ppm by mass) as set forth in claim 12, the Examiner takes the position that this argument is based upon opinion evidence and not factual evidence.

In response to the Examiner's position in this regard, please see the attached Rule 132 Declaration of N. Itayama, describing experiments, the results of which show that resorcinol bis(hydroxyethyl)ether, as an aromatic ether, disclosed in Example 2 of the Summer et al. reference cannot have the claimed purity of the present invention. In both the experiment in the Declaration and in Example 2 of Summer et al., the ether product was purified by crystallization in the presence of alkali metals. Since the Declaration shows that the presently claimed purity cannot be obtained by such a crystallization method, this overcomes the Examiner's position that the ether product prepared by the Summer et al. process would have the claimed purity because Summer et al. utilize a crystallization method to purify the ether product.

In response to Applicants' argument that the Summer et al. reference does not enable the art-skilled to obtain aromatic ethers having the claimed purity, the Examiner states that since Summer et al. use a crystallization method to purity their aromatic ether, as do Applicants, then Summer et al. would also be able to obtain an aromatic ether having the claimed purity.

However, as Applicants previously pointed out, Summer et al. use an **alkali metal** carbonate as a catalyst and an **alkali metal** hydroxide for crystallization. On the other hand, Applicants use an anion exchange resin as a catalyst, and a solvent having a solubility parameter ranging from 7.0 to 20.0, examples of which are given in the full paragraph on page 19 of the specification, none of which includes alkali metal compounds. The Examiner has failed to provide any evidence or scientific reasoning to establish the reasonableness of her belief that the claimed purity of aromatic ethers is an inherent characteristic of the Summer et al. reference.

The Examiner further argues that a factor to be considered in determining whether a purified form of an old product is obvious over the prior art is whether the claimed chemical compound or composition has the same utility as closely related materials in the prior art. In the previous Office Action, the Examiner cited *Ex parte Reed*, 135 USPQ 34 in attempting to support this argument.

However, the holding in *Ex parte Reed* presupposes that the art-skilled would be able to obtain a pure form of the product. This not the case here, where the Examiner has failed to provide any evidence or scientific reasoning to show that a product of the presently claimed purity, i.e. a metal content of less than 100 ppm, could be isolated from the reaction mixture of Summer et al. which uses an alkali metal carbonate as a catalyst and an alkali metal hydroxide for crystallization.

Furthermore, in view of cases decided by the CCPA and CAFC subsequent to the Board of Appeals decision in *Ex parte Reed*, it is now well-established that the degree of purity of a compound can render it patentable over the same compound in an unpurified state, even if both materials share the same utility. See, e.g., *In re Bergstrom*, 427 F.2d 1394, 1401, 166 USPQ 256, 262 (CCPA 1970):

> "[B]y definition, pure materials necessarily differ from <u>less</u> pure or impure materials and, if the latter are the only ones existing and available as a standard of reference, as seems to be the situation here, perforce the 'pure' materials are 'new' with respect to them" (footnote omitted, emphasis in original).

See also *Genentech Inc. v. Wellcome Foundation Ltd.*, 29 F.3d 1555, 1562, 31 USPQ2d 1161, 1166 (Fed. Cir. 1994) where claims to an enzyme preparation recited a particular specific activity; and the court called the specific activity limitation, which is a definition of purity, "the critical distinction of those claims over the less purified materials constituting the relevant prior art."

For these reasons, the expression of purity in claim 12, limiting the metal content in the aromatic ethers to less than 100 ppm by mass, is considered to render the subject matter of this claim patentable over the Summer et al. reference.

The rejection of claims 14-22 under 35 U.S.C. §102(b) as being anticipated by Guest et al. is respectfully traversed.

The Examiner's description of the disclosure of this reference includes a recognition of the use of Dowex 50 ion exchange resin in the reference process. Dowex 50, however, is a **cation** exchange resin as apparent from the attached copies of Ion Exchange Chromatography Buffers and Issues in Education, found during an Internet search. Accordingly, the Guest et al. reference fails to anticipate claim 14 (the only independent claim subject to this rejection) which requires use of an ***anion*** exchange resin as a catalyst.

For these reasons, Applicants take the position that the subject matter of claims 14-22 is not anticipated by Guest et al.

Therefore, in view of the foregoing remarks, it is submitted that each of the grounds of objection and rejection set forth by the Examiner has been overcome, and that the application is in condition for allowance. Such allowance is solicited.

Respectfully submitted,

Yoshiaki HIRANO et al.

By: [signature]

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June 19, 2006

Ion Exchange Chromatography Buffers

The goals of this exercise are to demonstrate how ion exchange chromatography works and at the same time to point up the rationale for choosing ion exchange buffers. For many of the buffers biochemists use, the acid or base form is electrically neutral and the other form is either anionic or cationic. The mode of chromatography used (more frequently anion exchange) determines which of these two possibilities is preferred. I am frequently surprised to see researchers who should know better indicate use of inappropriate buffers in published work.

I only did this once and it could use some touching up. The matrices I used were Dowex-1 (anion exchanger, chloride form) and Dowex-50 (cation exchanger, sodium form). I don't remember the mesh size, but the larger mesh number (smaller beads) the better. I made dilute (20 mM) buffer solutions (pH 7.5) using either triethanolamine-HCl ("Buffer A") or Na-HEPES ("Buffer C"), and identical buffers containing 2 M NaCl ("Buffer B" with triethanolamine and "Buffer D" with HEPES).

Students prepared minicolumns (1 mL bed volume) of Dowex-1 and Dowex-50. They washed the Dowex-1 column with 5 mL of Buffer B, then 5 mL of Buffer A to equilibrate it to pH 7.5, discarding the washes. Then they put over it, sequentially and collecting the run-through, 5 mL of Buffer A, Buffer B, Buffer A, Buffer C, Buffer B, and Buffer B. They finish by determining the pH of each fraction with a pH meter. The Dowex-50 column is treated the same way, except the washes are with Buffer D, then Buffer C, and the collected fractions are Buffer C, Buffer D, Buffer C, Buffer A, Buffer D, and Buffer D. The expected results are as follows:

Dowex-1:

- Buffer A: pH 7.5
- Buffer B: pH 7.5
- Buffer A: pH 7.5 again
- Buffer C: pH less than 7.5
- Buffer B: pH greater than 7.5
- Buffer B: pH about 7.5 again

Dowex-50:

- Buffer C: pH 7.5
- Buffer D: pH 7.5
- Buffer C: pH 7.5 again
- Buffer A: pH greater than 7.5
- Buffer D: pH less than 7.5
- Buffer D: pH about 7.5 again

Students are finally asked to explain any "unexpected" pH values. They should recognize that the pH of Buffer C will be decreased by passing through Dowex-1 because the anionic (basic) form of the buffer will be retained by the matrix and will subsequently be washed out by Buffer B, giving it a pH somewhat above 7.5. Similarly, the pH of Buffer A will be increased by passing through Dowex-50 because the cationic (acidic) form of the buffer will be retained by the matrix and will subsequently be washed out by Buffer D, giving it a pH somewhat below 7.5.

In fact, the pH changes the students observed were not as large as I had hoped, and the pH of untreated buffers didn't seem too stable. This could be corrected by adjustment of buffer concentrations, buffer/column volume ratios, finer Dowex mesh, or pH meters themselves. I still think this is a nice exercise, because it is simple to set up and to do, and kills two pedagogical birds with one stone.

Return to CHM 341

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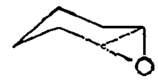
Cyclohexene oxide
7-Oxabicyclo[4.1.0] heptane
Epoxycyclohexane
1,2-Epoxycyclohexane
Epoxycyclohexane
Cyclohexene oxide
1,2-Epoxy-cyclohexane
Cyclohexane Oxide

RN: 286-20-4
MF: C6 H10 O
C6H10O
C6H10O
MW: 98.1448
bp (°C): 129 - 130
density: 0.97



IR: Show
3D model: Show
Hazard: C
Risk: 10 20/21/22 34
Safety: 16 26 36/37/39 45
MSDS: EN

Click on a product name to get more information on that compound, on a supplier name to get more information on that supplier.

Supplier	Description	References & Quantities		
AcrosOrganics	Cyclohexene oxide 98%	111211000	100 ML	Get offer
		111215000	500 ML	Get offer
abcr	Cyclohexene oxide , 98%	AV13185	100 g	Get offer
		AV13185	500 g	Get offer
		AV13185	2.5 kg	Get offer
advsyn	1,2-Epoxycyclohexane	119	on request	Get offer
chemik	Cyclohexene oxide	CHO058	on request	Get offer
cnpc	Epoxycyclohexane	286-20-4	on request	Get offer
dongfeng	Cyclohexane Oxide	14	on request	Get offer
dayangchem	Cyclohexene oxide	DY5575	on request	Get offer
DSL	Epoxycyclohexane	C010267	on request	Get offer
lancaster	Cyclohexene oxide	7577	100g	
		7577	500g	
lancaster	Cyclohexene oxide 98+, 98+ *	X07577G0100	100g	
		X07577G0500	500g	
MerckSchuchardtOHG	Epoxycyclohexane 7-Oxabicyclo[4.1.0]heptane Cyclohexene oxide	821862	on request	Get offer
cnpc	Epoxycyclohexane	on request		Get offer
triway	Cyclohexene oxide	286204	bulk, semi bulk	Get offer
wilshrchem	1,2-Epoxy-cyclohexane	286204	on request	Get offer
debayer	Cyclohexene oxide	286204	Reagent,Bulk, Semi Bulk	Get offer
matrixent	CYCLOHEXENE OXIDE	C167200	100 g	Get offer
matrixent	EPOXYCYCLOHEXANE	E010050	100 g	Get offer
chemos	1,2-Epoxycyclohexane	on request		Get offer
leputech	Cyclohexene oxide	286204	Bulk, Semi Bulk,Reagent	Get offer
bhumi	CYCLOHEXENE OXIDE	C167200	100 gm	Get offer
bhumi	EPOXYCYCLOHEXANE	E010050	100 gm	Get offer
degussa	Cyclohexene oxide	286204	on request	Get offer
adarshpetrochem	CYCLOHEXENE OXIDE	C167200	100 gm	Get offer

Enter a Chemical Name, CAS Number, Molecular Formula or Weight.
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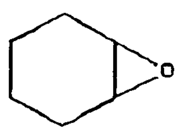
cyclohexene oxide [286-20-4]
Synonyms: 7-Oxabicyclo[4.1.0]heptane; cyclohexene oxide; Epoxycyclohexane;



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THE MERCK INDEX
NCI DATABASE

Formula	$C_6H_{10}O$	Molecular Weight	98.1444
CAS RN	286-20-4	Melting Point (°C)	-40
ACX Number	X1016917-8	Boiling Point (°C)	129 - 130
Density	0.97	Vapor Density	
Refractive Index		Vapor Pressure	
Evaporation Rate		Water Solubility	
Flash Point (°C)	27	EPA Code	
DOT Number		RTECS	RN7175000
Comments			

More information about the chemical is available in these categories:

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Information about this particular compound

ISSUES IN EDUCATION

By Beth Bruno 09/18/97

Patent Pending

Whispers of "genius" followed him everywhere, although no one ever called him that to his face. Bill Bauman, my dad, knew he was different as a child, because he skipped first and third grades and eventually graduated from high school with his brother George, who had started out three years ahead of him.

Local quarry boys, who had been held back in school, weren稚 impressed. "Think you're so smart?" they sneered, as they ambushed him and shoved him face first into the snow. They never really hurt him; they just kept him good and scared ... kept him humble, too.

After graduating from Hawkins, a private preparatory school in Cleveland, the fifteen-year-old Bill spent a year away from intense academic work to take shorthand and typing at the public high school. Under the tutelage of an art instructor there, he also learned the intricacies of wood carving, pewter molding, and batiking cloth. The following year he attended the Case School of Applied Science before he won a full scholarship to Yale University, where he completed an undergraduate degree and Ph.D. in chemistry.

Bill married his longtime sweetheart, Janet Kenny. They settled and raised five children in Midland, Michigan, headquarters of the Dow Chemical Company, his employer until retirement forty years later.

Chemical research demanded every ounce of Bill's creativity. His research centered around the development of ion exchange resins used to soften and purify water supplies. He developed Dowex 50, a cation exchange resin of unique and reproducible structure. He proposed the use of Dowex 50 as a universal tool for the recovery and purification of inorganic and organic cations, from plutonium to aminoacids. Soon Dow added Dowex 1, a comparable anion exchange resin, to the tool kit to extend the utility of ion exchange to all ions. Bill has published many papers defining the properties of Dowex 50 and Dowex 1, leading to their use in research laboratories around the world.

In addition to making new ion exchange resins, Bill found ways to use ion exchange to extract specific minerals from brine, a dense salt/mineral solution found underground in several locations around the world. Dow Chemical located in Midland because of the rich brine fields there. When brine is run through an ion exchange resin selective for a specific mineral such as magnesium, calcium, or lithium, the "captured" mineral can then be made available commercially. Lithium, for example, is an important element used in the production of batteries. Bill has developed a process of recovering magnesium from seawater using ion exchange.

Now retired maybe, but never inactive, Bill continues to develop new ideas for selectively extracting minerals from brine. His basement lab, not quite as fancy as the one at Dow, contains an old electric frypan, a microwave oven, small electronic scale, and various resins and crystals which he uses to test out his hypotheses. At age 82, he's inventing more than ever, and this time he owns the patents himself! He recently sold two patents to an international chemical company which is investing millions of dollars in his remarkable, cost-effective lithium extraction process.

Dad only recently told me about the bullies who had terrorized him for being so smart. I feel immensely relieved that they never actually hurt him. His inventive, playful mind kept me and my siblings entertained and constantly curious through the years. Dad knew he was different; it's lucky for all of us that he was happy to stay that way.

Please send questions or comments to bbruno@snet.net.

Previous columns are available.